REMARKS

Claims 1, 4-15, 17-18 and 20-47 are pending in the application. By this paper, claims 2, 3, 16 and 19 have been cancelled, claims 4, 5, 12, 20, 35-37 and 44 have amended and new claims 45, 46 and 47 have been added. No new matter is added by these amendments. Reconsideration and allowance of claims 1, 4-15, 17-18 and 20-47 are respectfully requested.

Allowable Subject Matter

The examiner has indicated that claims 21-29 are allowable. Further, the examiner has indicated that claims 3-11, 16 and 19-20 stand objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form.

Accordingly, claims 2 and 3 have been cancelled and new claim 45 has been added. New claim 45 includes the limitations of claim 3, rewritten in independent form to include limitations of claims 1 and 2, to place this claim in independent form. Claims 4 and 5, which had been dependent on claim 3 have been amended to make these claims dependent on new claim 45.

Further, claim 16 has been cancelled and new claim 46 has been added. Claim 46 includes the limitations of claim 16, rewritten in independent form to include limitations of claim 12, to place this claim in independent form.

Still further, claim 19 has been cancelled and new claim 47 has been added. Claim 47 includes the limitations of claim 19, rewritten in independent form to include limitations of claim 12, to place this claim in independent form. Claim 20, which had been dependent on claim 19 has been amended to be dependent on new claim 47.

Accordingly, withdrawal of the objection to claims 3-11, 16 and 19-20 is requested. An indication that independent claims 45-47 and dependent claim 4-11 and 20 are allowable is respectfully requested.

Rejection under 35 U.S.C. § 112

Claims 35-37 and 44 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as

the invention. By this paper, claims 35-37 and 44 have been amended to more clearly recite the claimed subject matter. In claim 35, the recitation in line 3 has been changed to "the FSS dielectric layer" in order to make clear the relationship to the recited "an FSS dielectric layer" of line 2. In claims 36 and 37, the recitation "some or all" has been replaced with some but not all in order to make this recitation consistent with the antecedent limitation of claim 33. In claim 44, the recitation of a "the conductive backplane structure" in line 4 has been changed to "the conductive ground plane" to be consistent with the conductive ground plane recited in line 3 of this claim.

No new matter is added by any of these amendments. These amendments are made solely to improve the clarity and consistency of the claimed subject matter. Accordingly, withdrawal of the 35 U.S.C. § 112, second paragraph, rejection of claims 35-37 and 44 is respectfully requested.

Rejections under 35 U.S.C. § 102(b)

Claims 1-2, 12-15, 17-18 and 30-32

Claims 1-2, 12-15, 17-18 and 30-32 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent number 4,367,474 to Schaubert, et al ("Schaubert"). According to the office action, Schaubert discloses in FIG. 11 a frequency selective surface (FSS) having an effective sheet capacitance which is variable to control resonance of an artificial magnetic conductor (AMC). Further according to the office action, the FSS of Schaubert comprises a single layer of conductive patches (10) disposed on a dielectric layer (12). Voltage variable capacitive circuit elements (20, 22, 24) are coupled with the FSS in FIG. 1, according to the office action.

This rejection is respectfully traversed. The rejected claims of the present application includes limitations nowhere shown in the disclosure of Schaubert, so the rejection under 35 U.S.C. § 102(b) is improper. Regarding independent claim 1, this claim recites

> a frequency selective surface (FSS) having an effective sheet capacitance which is variable to control resonant frequency of the AMC.

The effective sheet capacitance includes the intrinsic capacitance of the FSS and an added variable capacitance. In one embodiment described at page 10, line 21 through page 11, line 5 of the present application, "varactor diodes 412 are positioned between and connected to adjacent patches of the FSS 402. The varactor diodes 412 add a voltage variable capacitance in parallel with the intrinsic capacitance of the FSS 402, determined primarily by edge-to-edge coupling between adjacent patches." Other embodiments are also disclosed which provide this feature.

Schaubert fails to disclose the quoted limitation. Rather, Schaubert discloses, in FIG. 11 and at column 6, lines 15-45, a frequency scannable microstrip antenna in which

> Frequency scanning is obtained by introducing a progressive phase delay between the rf input and each subsequent conductive patch 10. In the embodiment of FIG. 11, the progressive phase delay is accomplished by increasing the length of the feed lines to each subsequent conductive patch by ΔL ....

Schaubert, column 6, lines 28-34. Thus, Schaubert does not disclose control of the resonant frequency by varying effective sheet capacitance, as required by claim 1. Indeed, Schaubert's Figure 11 clearly identifies the switching diode that varies capacitance as being connected between a given patch and the ground plane, and not being connected directly between patches as required to alter the effective sheet capacitance of the FSS.

Moreover, Schaubert does not teach the use of a frequency selective surface. He teaches the use of a one dimensional array of microstrip patch antennas, or resonant patches. In contrast, all FSS structures involve two-dimensional arrays (of patches or slots) on surfaces. Beyond that difference, microstrip patches are relatively large in comparison to the sub-wavelength size for the FSS patches in an AMC. A patch antenna shown by Schaubert resonates in its fundamental TM01 mode where one patch dimension (length or width) is approximately one half of a guide wavelength in size. This dimension is approximately $\lambda_o / \sqrt{\varepsilon_r}$ where λ_o is the free space wavelength, and ε_r is the substrate's relative dielectric constant, which is typically 10 or less for patch antennas. However, for a typical AMC, the patch dimensions are between $\lambda_o / 40$ and $\lambda_o / 20$ at the AMC resonance. The point to be made is that AMCs employ patches that are an order of magnitude smaller than patch antennas.

Thus, the microstrip patch antennas of Schaubert do not correspond to the frequency selective surface required by claim 1. Since claim 1 recites limitations nowhere shown by Schaubert, this reference can not anticipate the invention defined by claim 1.

Independent claim 30 includes similar limitations. Claim 30 recites a method for reconfiguring an AMC. The method includes acts of "applying control bias signals to voltage variable capacitive elements... thereby, reconfiguring effective sheet capacitance of the FSS." As explained above, Schaubert does not disclose varying effective sheet capacitance, as required by claim 30, and Schaubert does not disclose an FSS as require by claim 30. Thus, Schaubert does not anticipate claim 30, which is therefore allowable over this reference. Claims 31 and 32 are dependent from claim 30 and are allowable for the same reasons.

Regarding independent claim 12, the rejection of this claim over Schaubert suffers from the same failings as described above with respect to claims 1 and 30. Further, this claim has been amended to make the distinction over Schaubert even more explicit. Claim 12 has been amended to recite an AMC having an FSS which has "conductive patches disposed thereon" and "voltage variable capacitive circuit elements *coupled between conductive patches* of the FSS" *(emphasis added)*.

In contrast, FIG. 11 of Schaubert discloses patches 10 on a dielectric substrate and switchable diodes 20 coupled between the patches and a control means 48. Schaubert's diodes, even if they do form voltage variable capacitive circuit elements, which is not conceded, are not "coupled between conductive patches of the FSS."

Thus, claim 12 as amended recites limitations not shown in Schaubert and this reference can not anticipate the invention defined by this claim, which is therefore allowable. Claims 13-15 and 17-18 are dependent from claim 12 and are allowable for the same reasons.

Claims 33-36 and 38-44

Claims 33-36 and 38-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Sievenpiper, et al., "Low-profile, four-sector diversity antenna on high-impedance ground plane," published in Electronics Letters, Aug. 3, 2000, vol. 36, no. 16 ("Sievenpiper"). During a telephone conference between the undersigned attorney and the examiner to confirm the reference on which the rejection of claims 33-36 and 38-44 is based, the examiner identified the

Sievenpiper, et al., article in *Electronics Letters* as the appropriate reference, rather than "the IEEE article, June 19, 1999, cited by the Applicant" as stated in the office action at page 3, paragraph 5.

According to the office action, Fig. 1 of the cited Sievenpiper reference discloses the invention of claims 33-36 and 38-44. This rejection is respectfully traversed. Sievenpiper fails to show "conductive vias associated with *some but not all patches* of the pattern of conductive patches" as required by independent claim 33.

Fig. 1 of Sievenpiper shows a high impedance surface including a "flat metal ground plane, covered with [a] lattice of metal protrusions." The protrusions are also described in Sievenpiper Fig. 1 as vias and they extend from the ground plane through a layer of dielectric material (FR4) to contact upper plates and lower plates on top and bottom surfaces, respectively, of a thin polyimide layer.

The upper portion of Sievenpiper Fig. 1 is a top view of the high impedance surface. The lower portion of Sievenpiper Fig. 1 is a cross sectional view taken along the line labeled "vias" in the upper portion of Fig. 1. Vias located along the plane of this particular cross section only contact the upper plates. Because of the cross sectional view chosen in FIG. 1, vias connecting the ground plane to the lower plates are not visible. Similarly, in the top view of the upper portion of Fig. 1, since vias contacting the lower plates do not extend all the way to the top surface, the top terminals of these vias do not show in Fig. 1.

Thus, Sievenpiper fails to disclose an AMC with vias contacting only some but not all of the patches of the pattern of conductive patches, as required by independent claim 33. Sievenpiper Fig. 1 is at best inconclusive on this point. Fig. 1 appears to show vias contacting all of the plates, including both the upper plates and lower plates. None of the text or other figures of Sievenpiper show, describe or even suggest that conductive vias may contact some but not all patches of the AMC. Accordingly, since claim 33 includes limitations nowhere shown in Sievenpiper, this reference can not anticipate this claim, which is therefore allowable. Claims 34-36 and 38-44 are dependent from claim 33 and are allowable for the same reasons.

The two references by Sievenpiper, et al., dated June 19, 1999, from the 1999 MTT-S Symposium, have also been reviewed. Neither of these references disclose a "spacer layer including conductive vias associated with some but not all patches of the pattern of conductive

patches" as required by independent claim 33. This claim and its associated dependent claims are therefore allowable over these references as well.

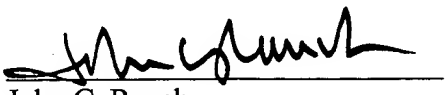
Claims 33-44

Claims 33-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by international patent publication number WO 99/50929 to Yablonovitch, et al. ("Yablonovitch"). This rejection is respectfully traversed. Sievenpiper fails to show "conductive vias associated with *some but not all patches* of the pattern of conductive patches" as required by independent claim 33. None of the figures or text of Yablonovitch disclose this claimed feature. For example in Yablonovitch FIG. 14a, every metal plate on both the top surface and the bottom surface of the thin dielectric layer has associated therewith a conductive via. Yablonovitch fails to show, describe or even suggest that some of the vias may be omitted from the design. Accordingly, this reference can not anticipate the invention defined by claim 33, which is therefore allowable. Claims 34-44 are dependent from claim 33 and are therefore allowable for the same reasons.

As noted, each of the rejected independent claims includes limitations nowhere shown in the applied references. Accordingly, withdrawal of the 35 U.S.C. § 102(b) rejections of claims 1-2, 12-15, 17-18, 30-32 and 33-44 is respectfully requested.

With this response, the application is believed to be in condition for allowance. Should the examiner deem a telephone conference to be of assistance is advancing the application to allowance, the examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,



John G. Rauch
Registration No. 37,218
Attorney for Applicant

July 18, 2003
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200